



ALAMEDA COUNTY TRANSPORTATION COMMISSION

Identifying Continuous and Connected Multimodal Arterial Networks



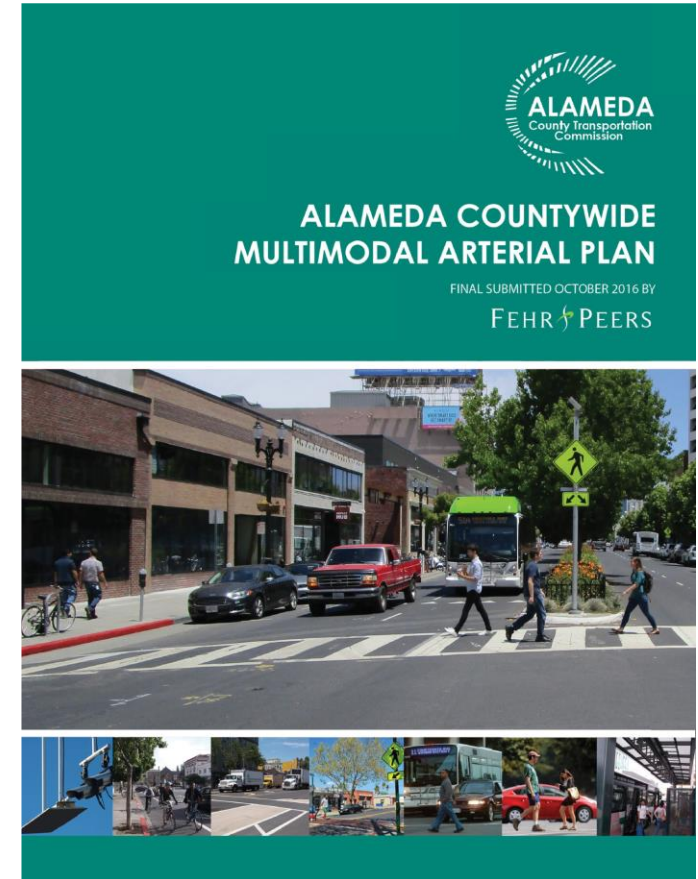
Caltrans Planning Horizons, February 23, 2018

Saravana Suthanthira, Principal Transportation Planner

Continuous and Connected Multimodal Arterials in the Alameda Countywide Plan

- Developed over 2-year period
- Final adoption in Summer 2016
 - Currently corridor projects are underway
- Presented at many forums
 - TRB, National APA, California APA and Caltrans Smart Mobility Forums

Consultant Team led by
FEHR & PEERS



Overview



Introduction

- ✓ Arterial Plan background
- ✓ Stakeholder engagement



Key Concepts

- ✓ Typology
- ✓ Modal priority



Methodology for Connected Networks

- ✓ Performance measures
- ✓ Needs assessment
- ✓ Improvements by mode
- ✓ Next steps

Alameda County | A CENTRAL HUB

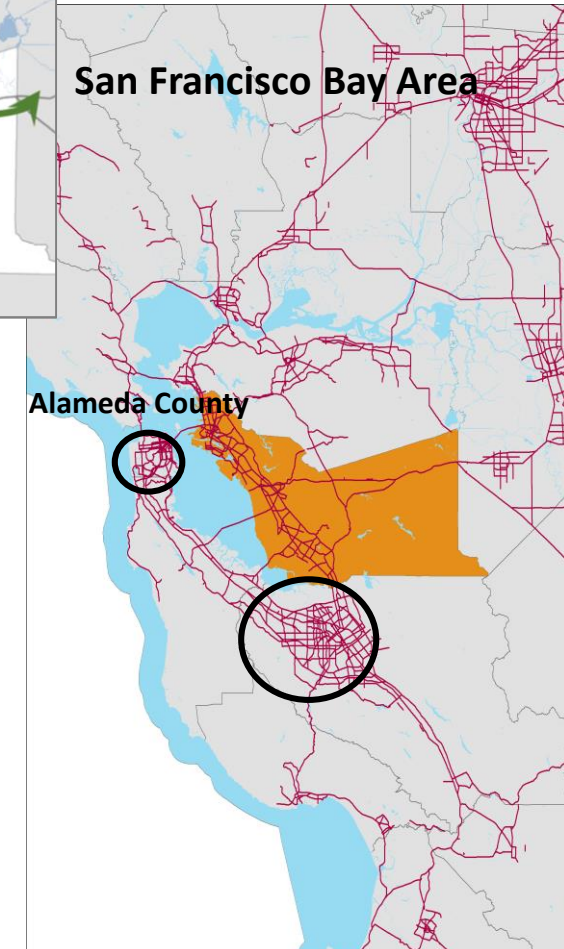
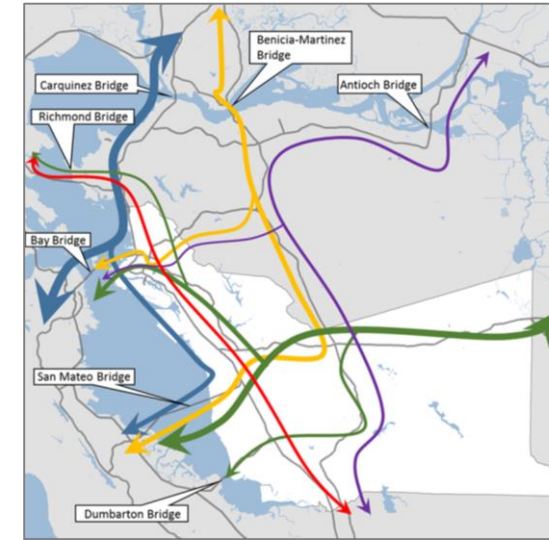
- Alameda County – **7th largest county in state**: 1.6 million people
- One of **24 Self-Help Counties in California** that will fund ~\$194 billion of voter-approved transportation investments by mid-century
- Diverse geography – urban/rural
- Diverse economy



Alameda County

A CENTRAL REGIONAL HUB

- Significant population growth: 31%
- Significant employment growth: 42%
- Most congested roads in the region in Alameda County
 - 78% of all bridge crossings start, end or traverse
 - Nearly two-thirds of all Transbay transit trips board/alight
 - 50% of the region's top 10 congested corridors
 - Over 60% of regional vehicle hours of delay
- Wide range of land uses



Arterial Roadways

Essential to Alameda County:

- Regional access to state highway system
- Multimodal access within and around communities and employment centers
- Support community's economic development
- Serve 40% of the County's average daily traffic, second only to freeways



Alameda CTC | WHAT WE DO

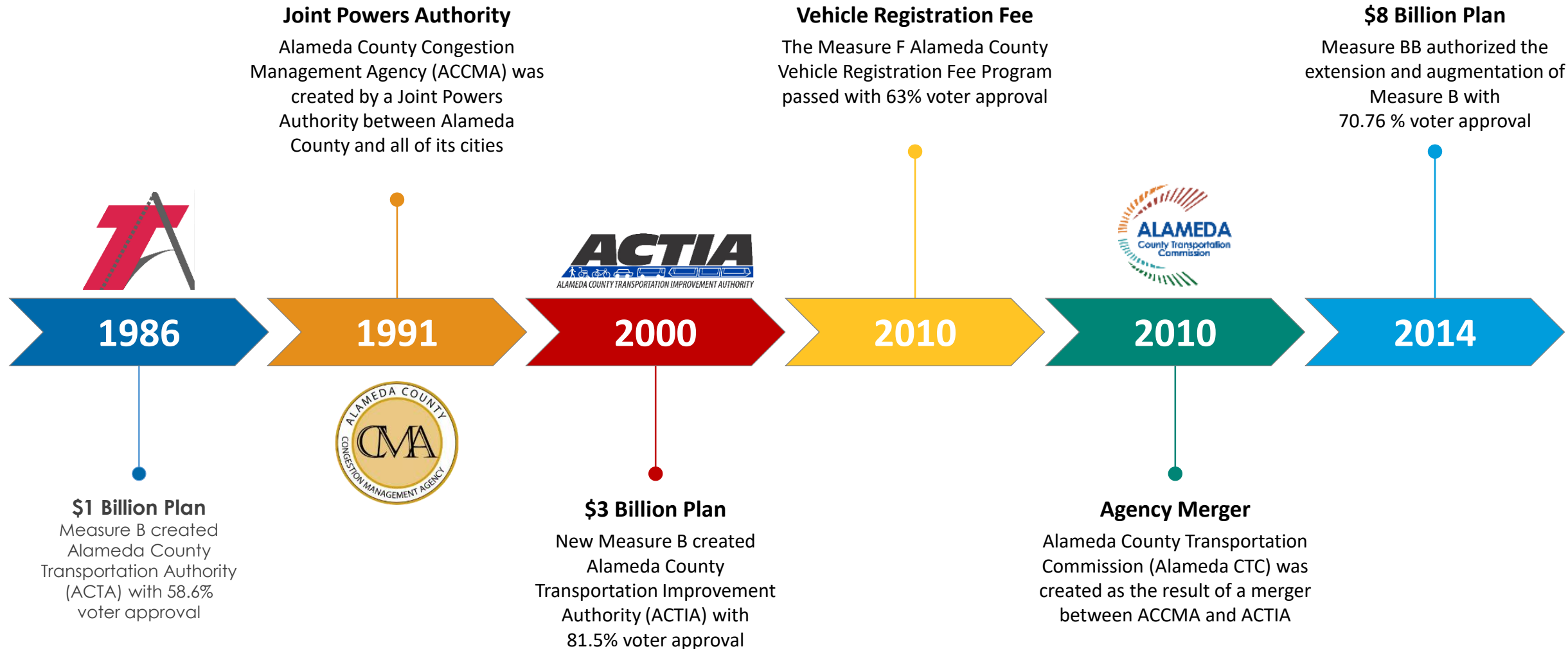
- The Alameda County Transportation Commission (Alameda CTC) serves as both the transportation sales tax authority and congestion management agency for the County of Alameda
 - Governed by a 22-member Commission
 - 31-member staff



Alameda CTC | WHAT WE DO

- Alameda CTC's mission is to:
 - **Plan:** develop and coordinate various short- and long-range transportation plans with local jurisdictions and regional agencies
 - **Fund:** provide funding for programs and allocate federal, state, regional and local sales tax dollars toward transportation projects and programs in the County
 - **Deliver:** deliver and manage significant, voter-approved transportation capital projects and county programs
- Alameda CTC advocates for good transportation policy at all levels of government

Alameda CTC History



Three Significant Modal Plans

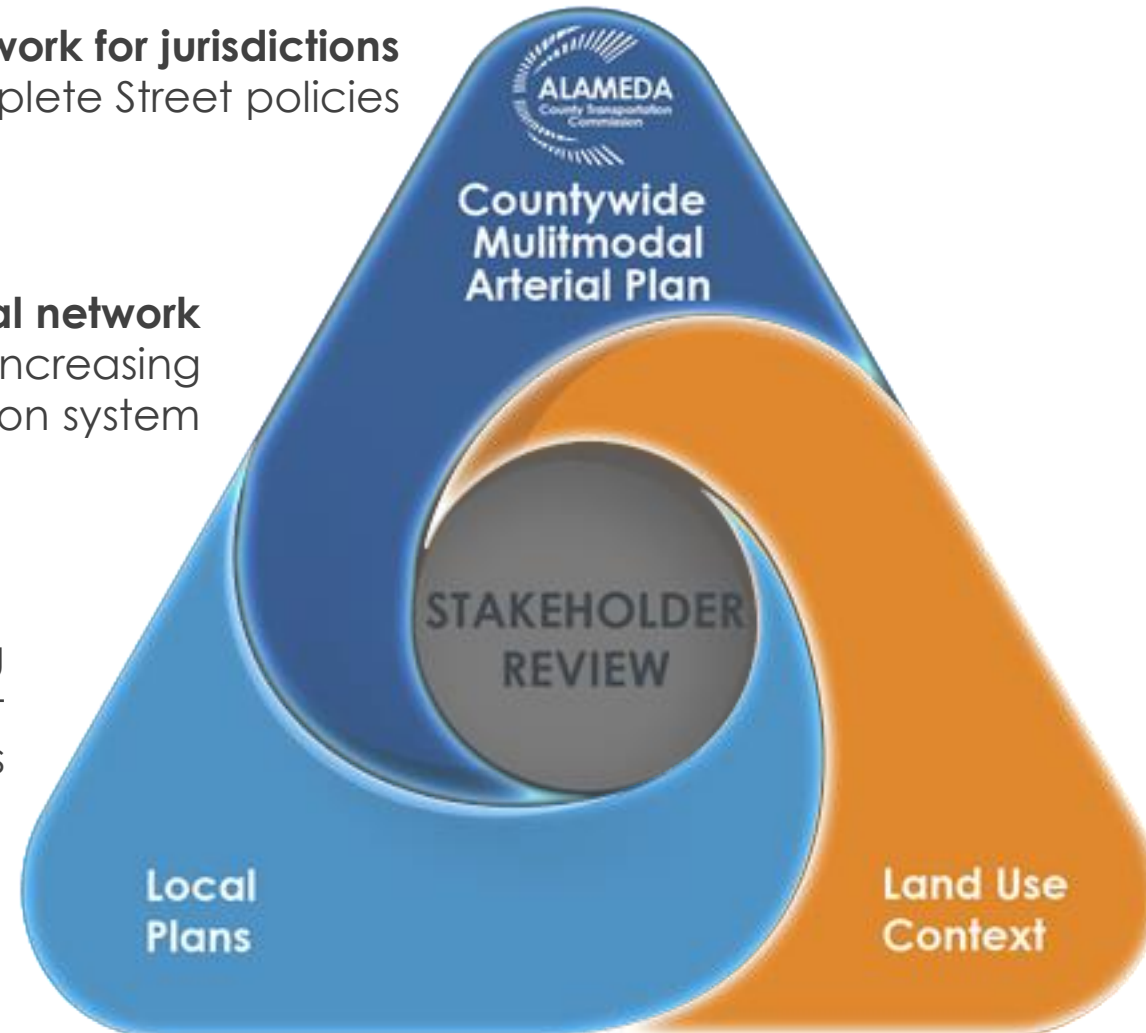
- Countywide Multimodal Arterial Plan
 - Provides framework for designing, prioritizing and implementing improvements to Alameda County's 1,200 centerline miles of roadways
- Countywide Transit Plan
 - Enables better alignment of transit, land use and economic development goals and objectives of cities and transit operators
 - Considers emerging technologies
- Countywide Goods Movement Plan
 - Ensures consistency between regional, state and federal plans
 - Provides an advocacy platform for funding

Arterial Plan Purpose

Provide countywide framework for jurisdictions
to meet mandated Complete Street policies

Identify multimodal arterial network improvements to accommodate increasing demands on transportation system

Build upon local and regional planning efforts including Countywide Transit and Goods Movement Plans



Stakeholder Engagement



60+ meetings held

**Agency and non-
agency stakeholders**

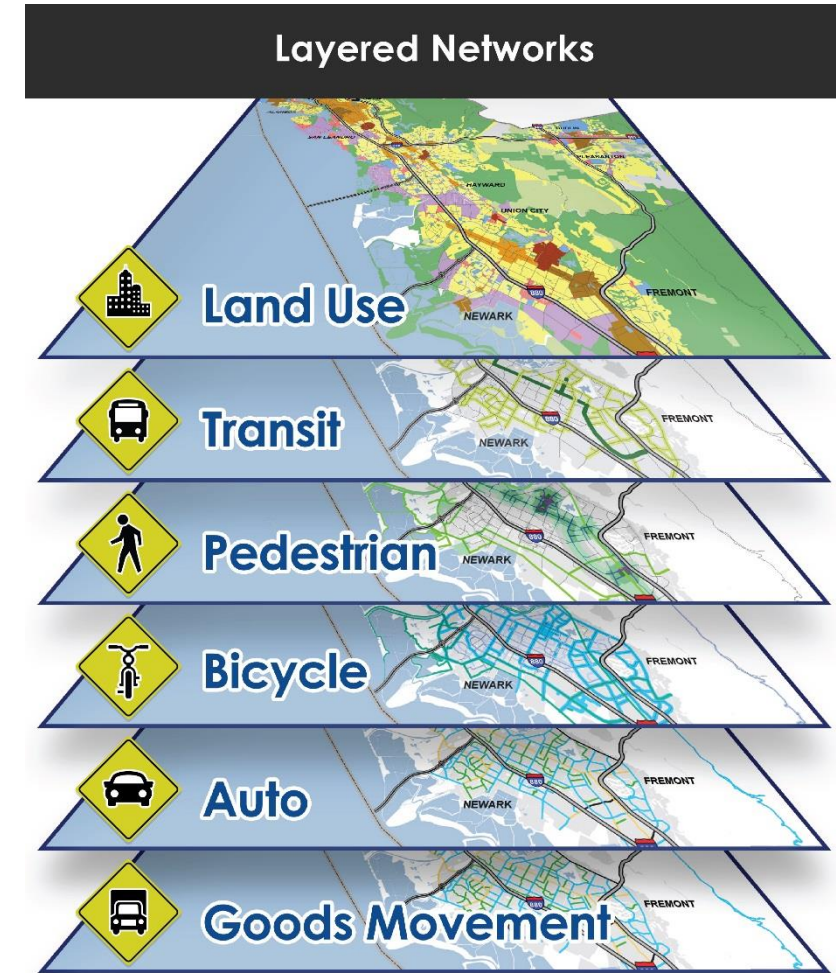
**1,000+ comments
received**

Key Concepts

✓ Typology

✓ Modal Priority

- Reflects...
 - How streets function for all users
 - The relationship between streets and adjacent land use
- Expands considerations
 - Balances needs of all users
 - Defines a Countywide Complete Streets network



Key Concepts | TYPOLOGY



Land Use Context



Auto Function



Modes of Travel &
Multimodal Networks

= MAP Street Typology Framework

Typology | LAND USE

Informs appropriate street elements that support/facilitate serving land use

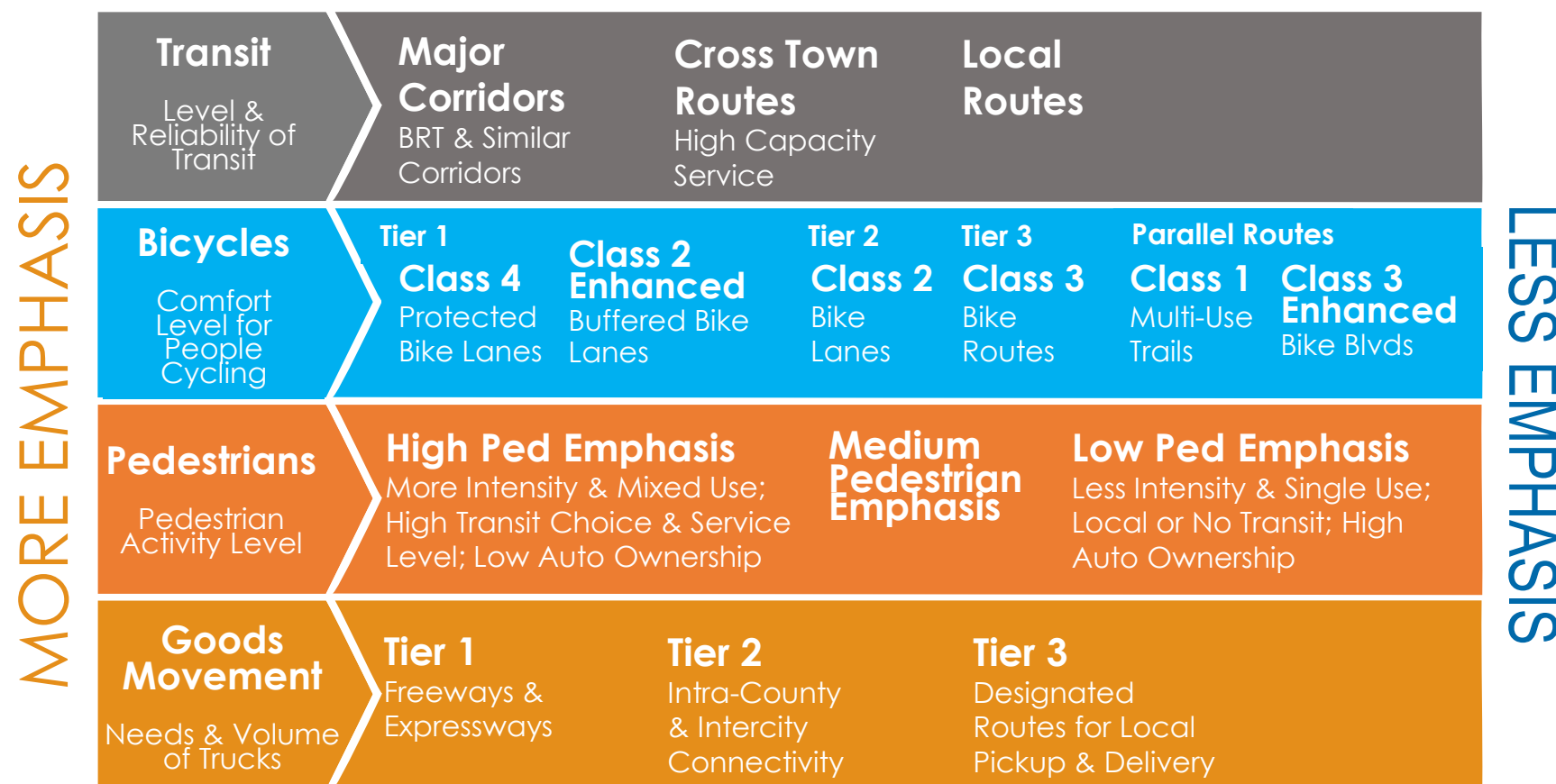
- Urban land use types
 - Downtown Mixed Use
 - Town Center Mixed Use
 - Corridor/Neighborhood Center Mixed Use
 - Education/Public/Semi-Public
 - Parks
- Suburban land use types
 - Mixed Use
 - Commercial
 - Residential
 - Rural/Open Space
- Industrial land use



Auto Function

Throughway	Greater than 10,000 ADT and at least 50% of ADT travels 8+ miles
County Connector	Greater than 10,000 ADT and at least 45% of ADT travels 6+ miles
Community Connector	At least 50% of ADT travels 4+ miles
Neighborhood Connector	At least 50% of ADT travels less than 4 miles

Multimodal Function



Modal Priority



Land Use Context



Auto Function



Modes of Travel &
Multimodal Networks



Initial Modal Priorities

- Method for balancing modes
- Informs needs assessment and recommended improvements

Modal Priority

Modal priority defined by land use type

EMPHASIS

High
↑
↓
Low

Urban

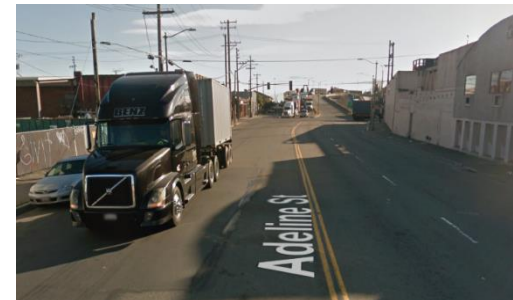
- Transit
- Pedestrian
- Bicycle
- Auto
- Truck

Suburban

- Transit
- Auto
- Truck
- Bicycle
- Pedestrian

Industrial

- Transit
- Truck
- Auto
- Bicycle
- Pedestrian



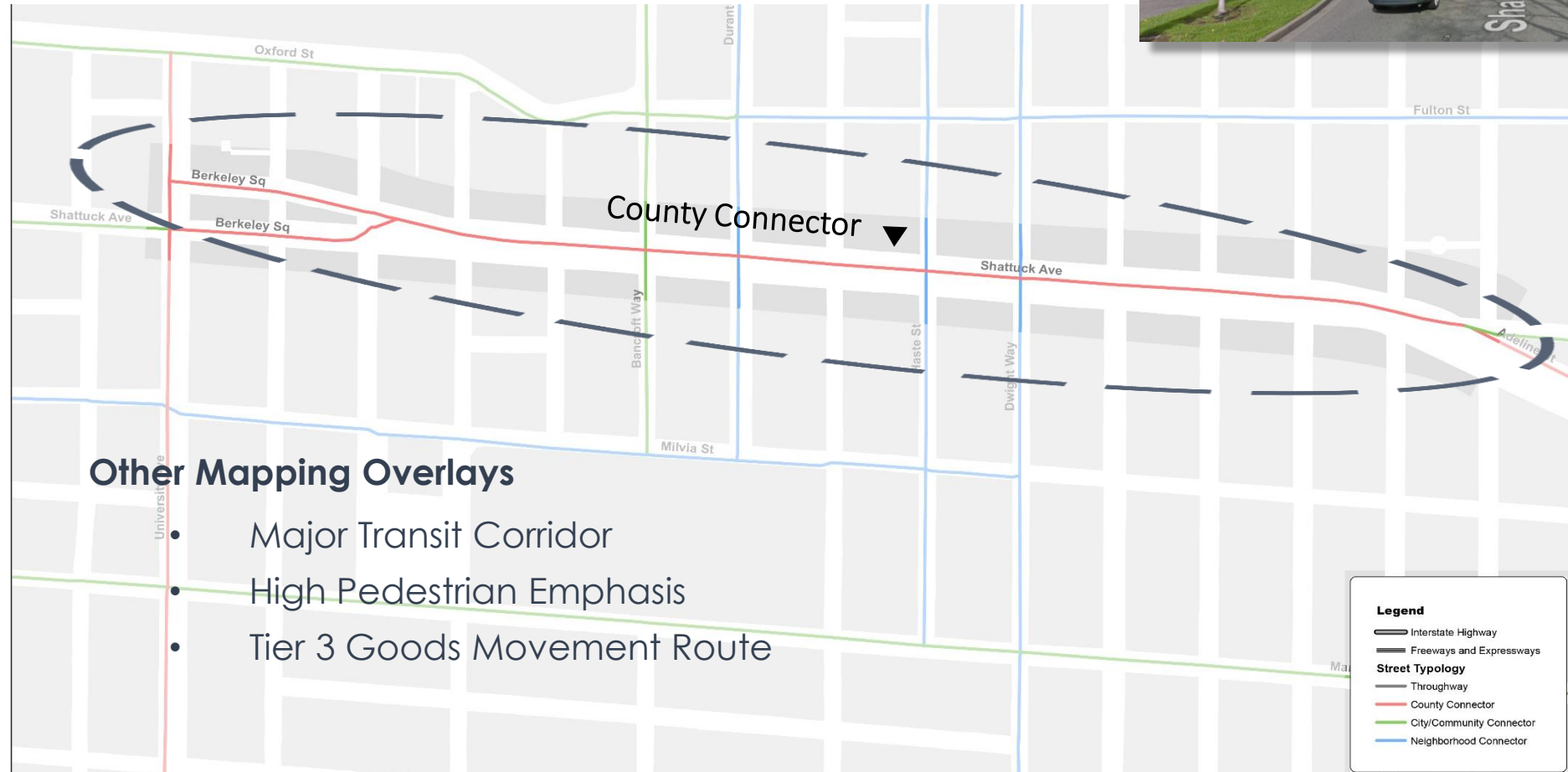
Balancing Modes

	Urban Land Use	Suburban Land Use	Industrial Land Use
Associated Modal Priorities	Transit: Downtown Mixed Use	Transit: Mixed Use	Transit
	Pedestrian: Town Center Mixed Use	Auto: Throughway	Goods Movement: Tier 2
	Pedestrian: Corridor/Neighborhood	Auto: Residential	Goods Movement/Truck
	Bicycle: Mixed use	Goods Movement/Truck	Auto
	Auto: Throughway	Bicycle: Class 1, Enhanced Class 2, Enhanced Class 3, or Class 4	Bicycle: Class 1, Enhanced Class 2, Enhanced Class 3, or Class 4
	Auto: Education/Public/Semi-Public	Bicycle: Other/Unknown	
	Goods Movement/Truck	Pedestrian	Pedestrian
	Transit: Crosstown Routes	Transit: Crosstown Routes	Transit: Crosstown Routes
	Pedestrian: Tier 2	Auto: County Connector	Goods Movement: Tier 3
	Bicycle: Class 2	Goods Movement: Tier 3	Auto: County Connector
	Auto: County Connector	Bicycle: Class 2	Bicycle: Class 2
	Pedestrian: Tier 3	Pedestrian: Tier 2	Pedestrian: Tier 2
	Bicycle: Class 3	Auto: Community Connector	Auto: Community Connector
	Transit: Local Routes	Bicycle: Class 3	Bicycle: Class 3
	Goods Movement: Tier 3	Pedestrian: Tier 3	Pedestrian: Tier 3
	Auto: Community Connector	Transit: Local Routes	Transit: Local Routes
	Auto: Neighborhood Connector	Auto: Neighborhood Connector	Auto: Neighborhood Connector

*Note: Jurisdictions have final say on Modal Priorities.

Typology Example

SHATTUCK AVE (UNIVERSITY AVE TO DERBY ST)



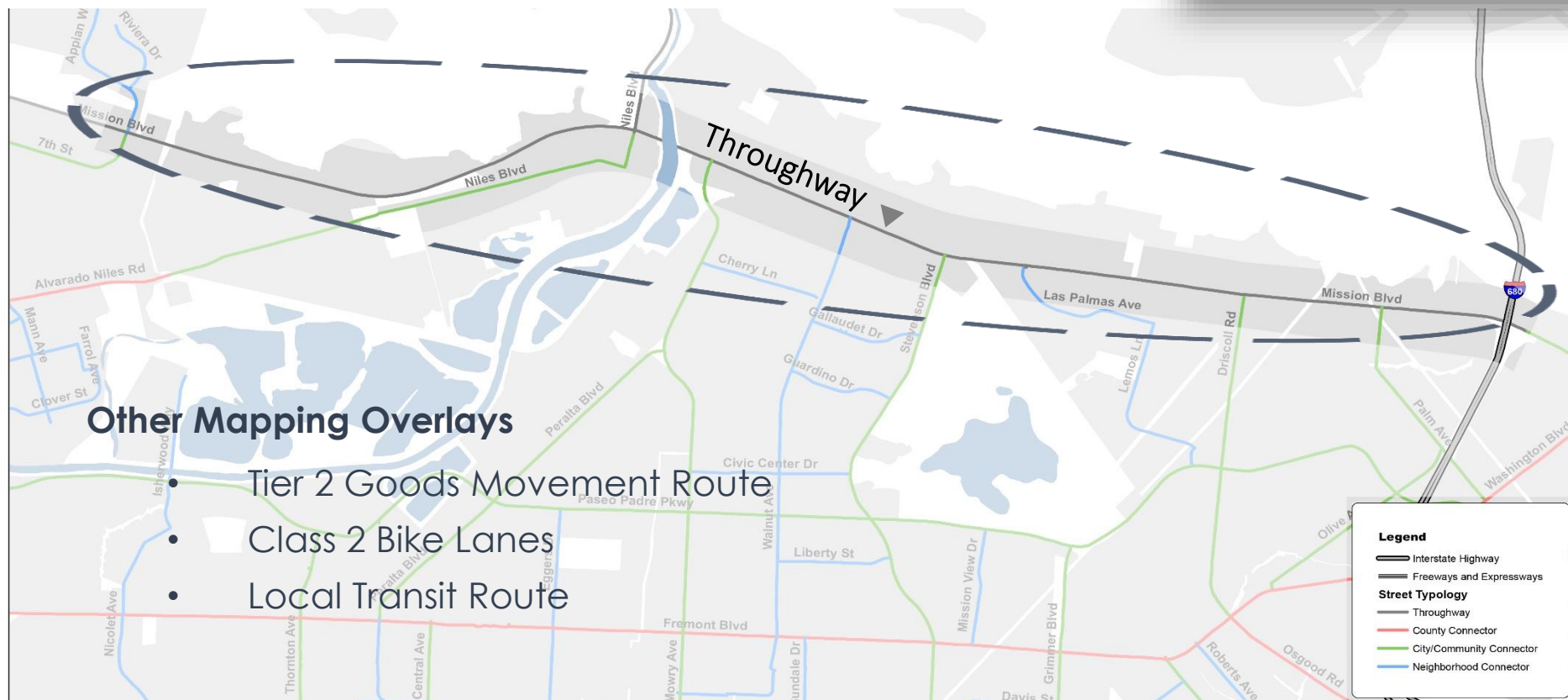
Modal Priority Example

LAND USE CONTEXT – URBAN

Is it a Major Transit Corridor?	Yes	1st Priority: Transit
Is it a Tier 1 (High) Pedestrian Emphasis?	Yes	2nd Priority: Pedestrian
Is it a Bicycle Enhanced Class 2, Enhanced Class 3 or Class 4?	No	
Is it a Throughway?	No	
Is it a Tier 2 Goods Movement Route?	No	
Is it a Transit Crosstown Route?	No	
Is it a Tier 2 (Medium) Pedestrian Emphasis?	No	
Is it a Bicycle Class 2?	No	
Is it a County Connector?	Yes	3rd Priority: Auto
Is it a Tier 3 (Low) Pedestrian Emphasis?	No	
Is it a Bicycle Class 3?	No	
Is it a Local Transit Route?	No	
Is it a Tier 3 Goods Movement Route?	Yes	4th Priority: Goods Movement
Is it a Community Connector?	No	
Is it a Neighborhood Connector?	No	

Typology Example

MISSION BLVD (FREMONT CITY LIMITS - I-680)



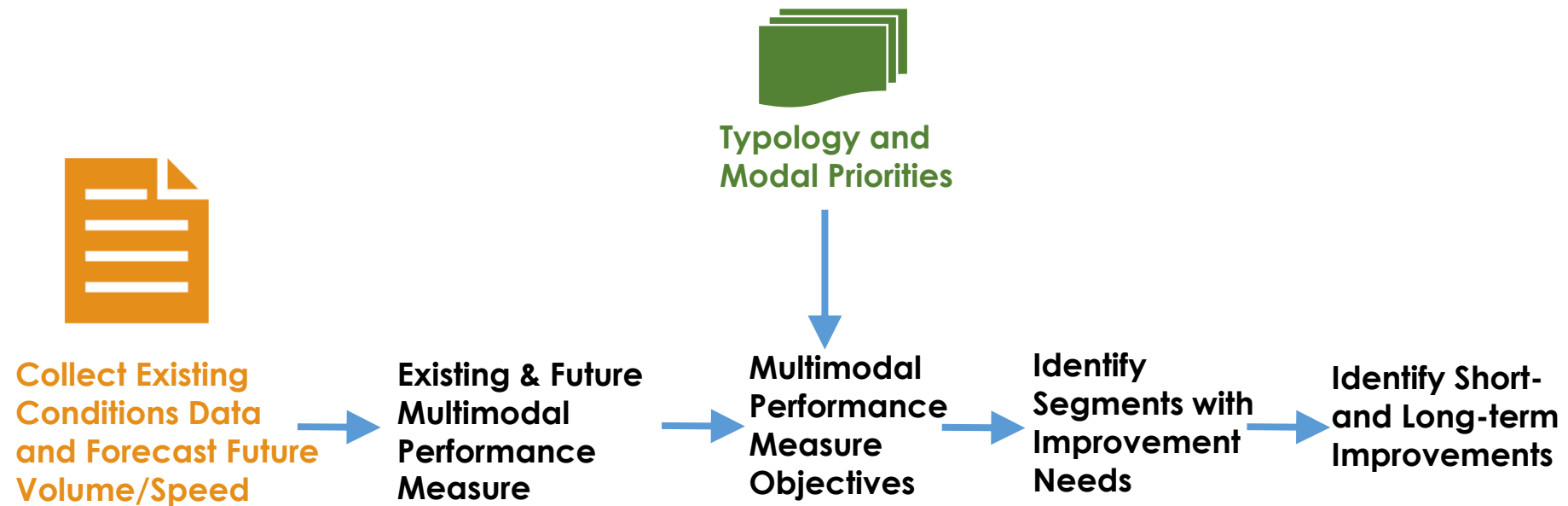
Modal Priority Example

LAND USE CONTEXT – SUBURBAN

Is it a Major Transit Corridor?	No	
Is it a Throughway?	Yes	1 st Priority: Auto 2 nd Priority: Goods Movement
Is it a Tier 2 Goods Movement Route?	Yes	
Is it a Bicycle Enhanced Class 2, Enhanced Class 3 or Class 4?	No	
Is it a Tier 1 (High) Pedestrian Emphasis?	No	
Is it a Transit Crosstown Route?	No	
Is it a County Connector?	No	
Is it a Tier 3 Goods Movement Route?	No	
Is it a Bicycle Class 2?	Yes	3 rd Priority: Bicycle
Is it a Tier 2 (Medium) Pedestrian Emphasis?	No	
Is it a Community Connector?	No	
Is it a Bicycle Class 3?	No	
Is it a Tier 3 (Low) Pedestrian Emphasis?	No	
Is it a Local Transit Route?	Yes	4 th Priority: Transit
Is it a Neighborhood Connector?	No	

Needs Assessment Framework

Typology and modal priorities inform multimodal performance objectives to identify segments with needs and appropriate improvements



Performance Measures

TRANSIT



Travel speed – average p.m. peak hour transit speed

Reliability – p.m. peak hour transit speed to off-peak hour transit speed ratio

Infrastructure index – bus stop design along transit corridors based on:

- Bulbouts
- Bus stop length
- Far versus near-side stops
- Sidewalk width
- Bus stop amenities
- Wayfinding info

Performance Measures

BICYCLE



Comfort Index – assess bicyclist comfort level based on:

- Number of travel lanes
- Traffic speed
- Presence and width of bike lanes
- Physical barriers

PEDESTRIAN



Comfort Index – assess pedestrian comfort level based on

- Land use
- Presence of sidewalk/buffer
- Traffic volume/speed
- Crossing distance

Performance Measures

AUTO

Congested speed – average p.m. peak period speed

Reliability – p.m. peak hour volume-to-capacity ratio



GOODS MOVEMENT

Truck route accommodation index – assessment of curb lane width



Performance Objectives

FACILITY-SPECIFIC MEASURES

MAP Performance Measure	Modal Objectives				
	Autos	Transit	Pedestrian	Bicycle	Trucks
Auto Congested Speed	> 40% of Posted Speed	N/A	N/A	N/A	> 40% of Posted Speed
Auto Reliability	< 0.8 (V/C Ratio)	N/A	N/A	N/A	< 0.8 (V/C Ratio)

Performance Objectives

FACILITY-SPECIFIC MEASURES

Performance Measure	Modal Objectives				
	Autos	Transit	Pedestrian	Bicycle	Trucks
Transit Travel Speed	N/A	> 75% of Auto Speed	N/A	N/A	N/A
Transit Reliability	N/A	> 0.7 (PM peak hour-to-non-peak hour transit speed ratio)	N/A	N/A	N/A
Transit Infrastructure Index	N/A	High	N/A	N/A	N/A

Performance Objectives

FACILITY-SPECIFIC MEASURES

Performance Measure	Modal Objectives				
	Autos	Transit	Pedestrian	Bicycle	Trucks
Pedestrian Comfort Index	N/A	Medium, High or Excellent	High or Excellent	N/A	N/A
Bicycle Comfort Index	N/A	N/A	N/A	High or Excellent	N/A
Truck Route Accommodation Index	N/A	N/A	N/A	N/A	High

Data Collection

List of Data	Data Source	Data Coverage (miles)
Cross-sectional measurements and design characteristics	Aerial imagery and design files provided by local jurisdictions	670
Automobile volumes	Alameda CTC Travel Demand Model, and count data provided by local jurisdictions	980
Automobile travel speed	INRIX, Alameda CTC Travel Demand Model, and speed data provided by local jurisdictions	980
Transit speed	Local transit agencies	240
Transit reliability	Local transit agencies	240
Transit routes	Local transit agencies	480
Pavement condition index (PCI)	MTC Streetsaver Database	960
ITS infrastructure	Local jurisdictions	390
Goods movement routes	Local jurisdictions and Alameda CTC	670
Collision History	TIMS database	850
Land Use	Association of Bay Area Governments (ABAG), Sustainable Communities Strategy Land Use, local jurisdictions	1,200

GIS Tool

GIS TOOL CAPABILITIES

- Assess multimodal performance
- Perform needs assessment evaluation
- Quantify available right-of-way that could be repurposed for improvements
- Identify multimodal improvements
- Integrate with CityEngine 3-D visualization software

BASELINE CONDITIONS



PROPOSED IMPROVEMENTS

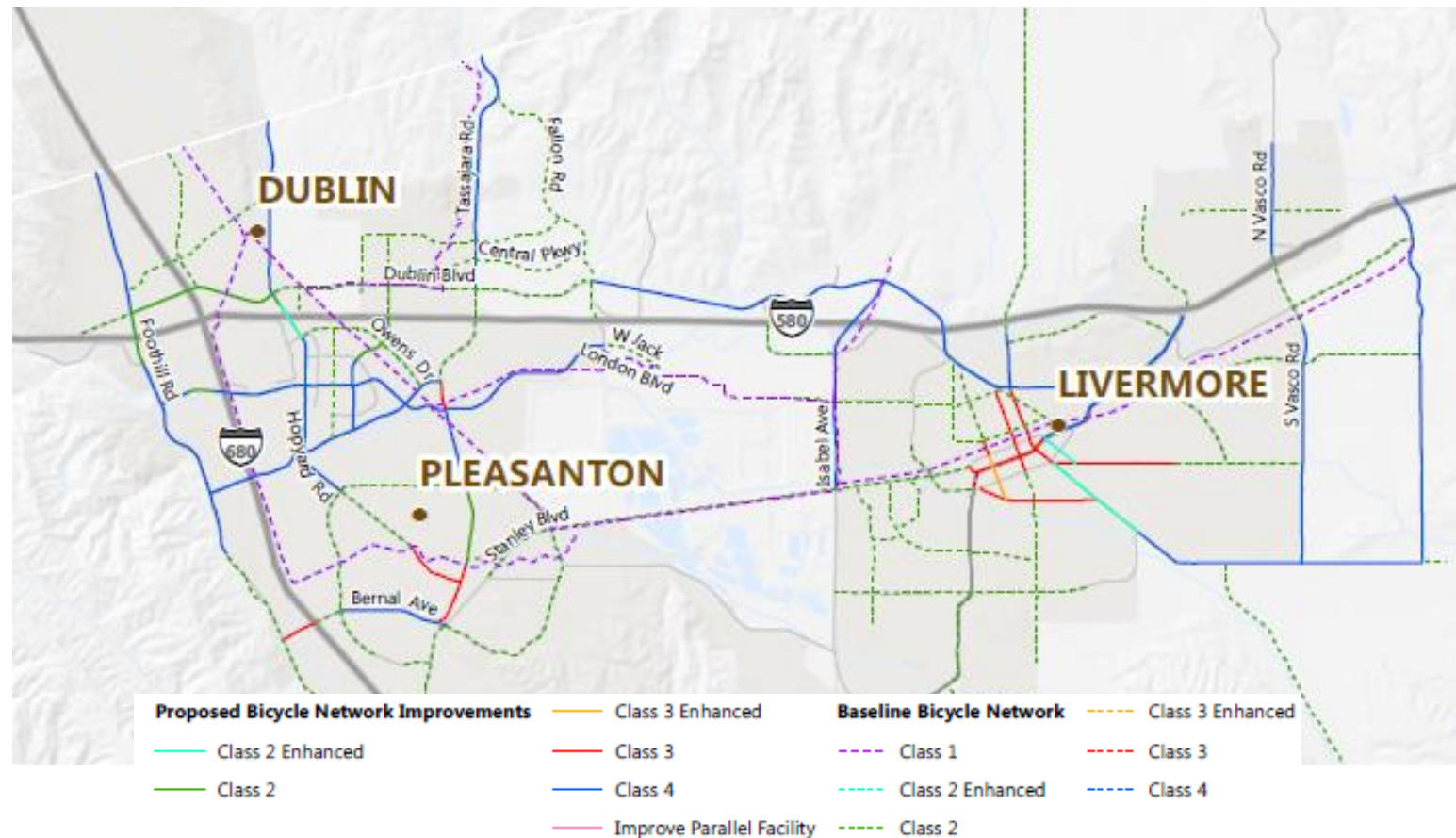


Analysis Approach

1. Evaluate existing conditions for all modes
2. Develop future year volume and speed forecasts
3. Evaluate multimodal performance measures for future year conditions
4. Compare multimodal measures to objectives to identify areas of need
5. Identify multimodal improvements
6. Evaluate connectivity to identify network gaps in each mode

Network Connectivity Checks

Additional multimodal improvements were identified in an effort to develop a complete and connected network for each mode



Transit Network Improvements

CONSIDERED IMPROVEMENTS

- Dedicated transit lane improvements
- Rapid bus improvements
- Enhanced bus improvements



Pedestrian Network Improvements

CONSIDERED IMPROVEMENTS

- Sidewalk enhancements
- Crosswalk enhancements
- Curb bulbouts
- Pedestrian scale lighting
- Streetscape enhancements



Bike Network Improvements

CONSIDERED IMPROVEMENTS

- Class 2 Bicycle Lanes
- Class 2 Enhanced Buffered Bicycle Lanes
- Class 3 Bicycle Routes
- Class 3 Enhanced Bicycle Boulevards
- Class 4 Protected Bicycle Lanes



Auto Network Improvements

CONSIDERED IMPROVEMENTS

- **Low level of ITS infrastructure** – field-to-center communications with ability to remotely monitor and manage traffic signals
- **Medium level of ITS infrastructure** – low level plus CCTV cameras, time-of-day signal timing, adaptive signal control, transit signal priority
- **High level of ITS infrastructure** – medium level plus changeable message signs, trailblazer signs, connected vehicle technologies



Goods Movement Network Improvements

CONSIDERED IMPROVEMENTS

- Curb lane widening to 12 feet or greater along goods movement routes



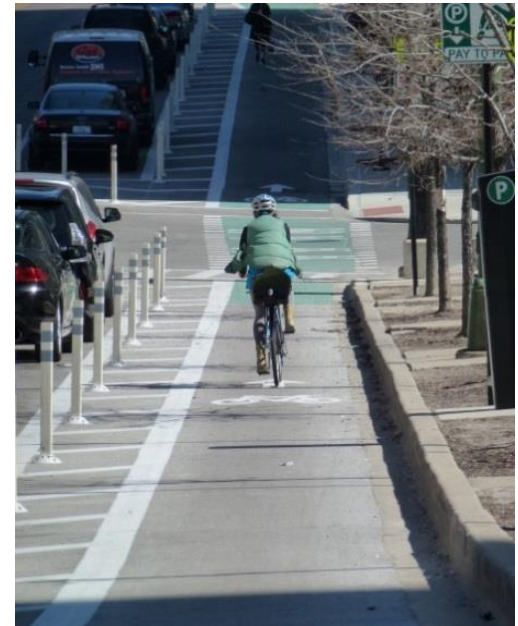
Multimodal Improvement Recommendations

- 140 miles of transit network improvements
- 250 miles of bicycle network improvements
- 250 miles of pedestrian network improvements
- 225 miles of ITS improvements
- 22 miles of goods movement network improvements

**BASELINE
CONDITIONS**



**PROPOSED
IMPROVEMENTS**



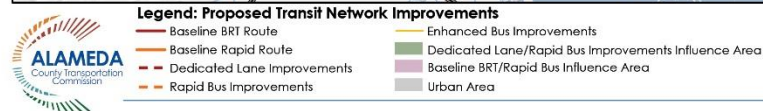
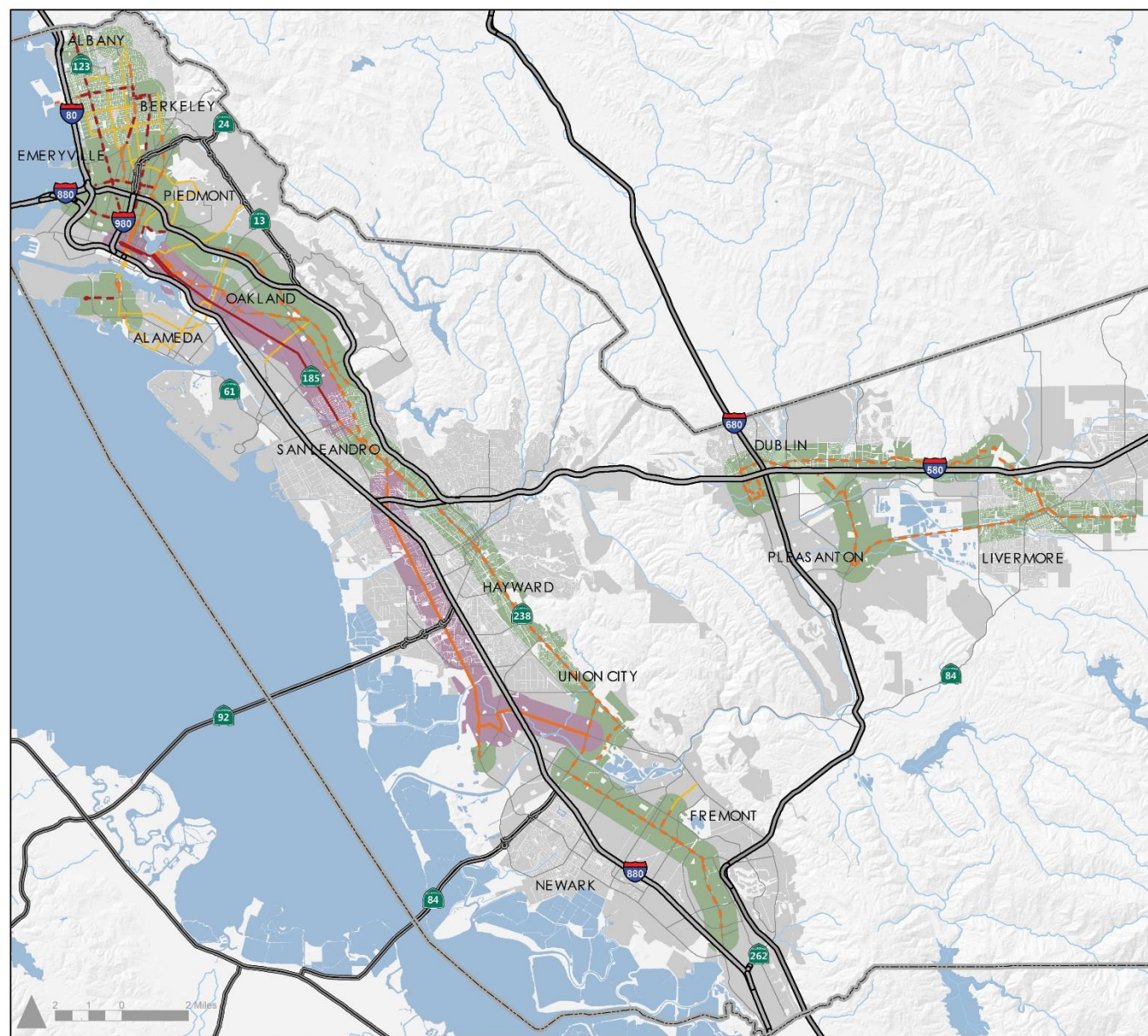
Arterial Network

PERFORMANCE OBJECTIVE RESULTS

Miles That Meet Performance Objective Along High Modal Priority Segments 2040 Conditions

Performance Measures		Miles Without Proposed Improvements	Miles With Proposed Improvements	Miles Net Difference
	Transit Travel Speed	21	45	+24 (+214%)
	Transit Reliability	56	112	+56 (+200%)
	Transit Infrastructure Index	27	127	+100 (+470%)
	Pedestrian Comfort Index	133	188	+55 (+141%)
	Bicycle Comfort Index	35	146	+111 (+417%)
	Truck Route Accommodation Index	83	105	+22 (+127%)

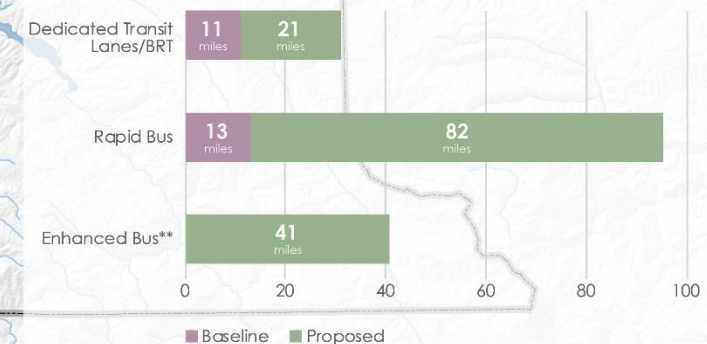
Transit Network – 150 miles; Auto Network – 250 miles;
Bike Network – 268 miles; Pedestrian Network – 207 miles;
Goods Movement – 135 miles



Considered transit network improvements include:

- **Enhanced Bus Improvements** – Enhanced Bus services are designed around on-street improvements that reduce travel time, improve passenger comfort and increase operational efficiency. Improvements under this category include:
 - Bus stop consolidation
 - Traffic signal optimization
 - Far-side bus stop relocation
 - Minimum 80 feet red curb at bus stops
 - American with Disabilities Act (ADA) compliant bus stops
 - Curb bulbouts at bus stops, where feasible
 - Bus stop amenity enhancements
- **Rapid Bus Improvements** – Rapid Bus improvements include those for the Enhanced Bus category, in addition to the following improvements:
 - Transit signal priority
 - Queue jump lanes or queue bypass lanes, where feasible
- **Dedicated Transit Lane Improvements** – Dedicated transit lanes is a system of improvements that build upon the features of Enhanced and Rapid Bus. Dedicated transit lane improvements include those for the Enhanced and Rapid Bus (with the exception of queue jump or bypass lanes) categories, in addition to the following improvements:
 - Level boarding platforms
 - Dedicated on-street transit only lanes
 - Pedestrian enhancements

Proposed Improvements Summary*

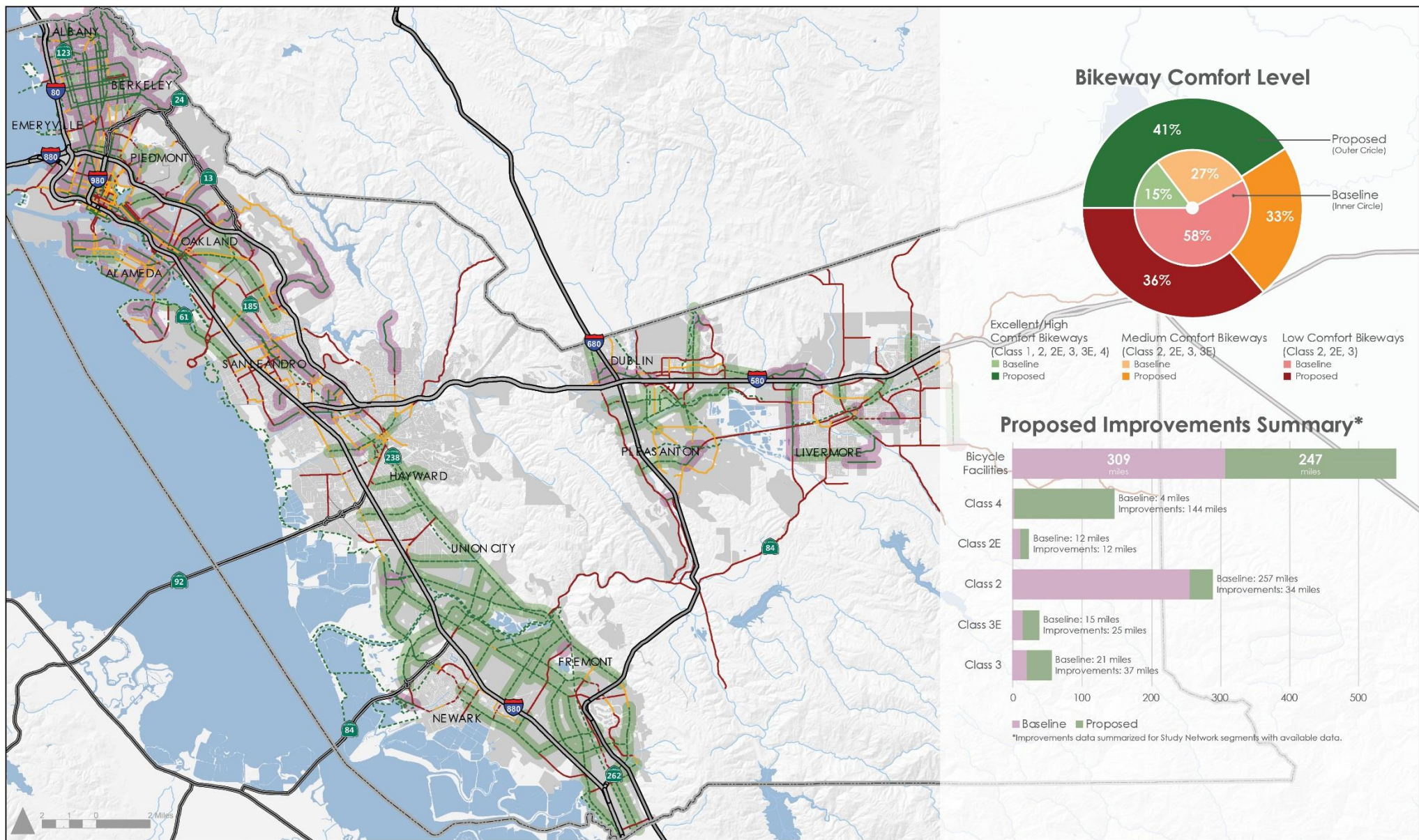


Legend: Baseline Proposed

*Improvements data summarized for Study Network segments with available data.
 **Note that baseline improvements were not quantified.

Alameda Countywide Multimodal Arterial Plan

Alameda Countywide Transit Network Improvements



Alameda Countywide Multimodal Arterial Plan

Alameda Countywide Bicycle Network Improvements

Moving Forward to Implementation

- **A significant resource** – wealth of data and analysis of future projects for a comprehensive understanding of land use context and infrastructure performance
 - **Improved funding potential for local jurisdiction projects**
- Local jurisdictions are referring to this plan to develop their **local modal plans**, particularly bike plans
- In the long-term this plan **provides the basis to ensure connected and continuous multimodal corridors** across the County

Specific Next Steps

- Developed Complete Street Design Guidelines for a sub-county region
- Launched multimodal modal arterial corridor projects to identify short and long-term projects and programs building on the Arterial Plan recommendations
 - Two corridors
 - San Pablo Avenue (major east-west corridor)
 - East 14th Street/Mission Boulevard (major north-south corridor)
 - More corridors on the list

Questions?





Thank You

Saravana Suthanthira, AICP
Principal Transportation Planner
ssuthanthira@alamedactc.org

Plan Website
https://www.alamedactc.org/app_pages/view/13346